CLAIMS

What is claimed is:

1. An apparatus comprising:

a low magnetic-coercivity layer of material (LMC layer) having a majority electron-spin-polarization (M-ESP);

an energy-gap coupled with said LMC layer, wherein a flow of spin-polarized electrons having an electron-spin-polarization (ESP) anti-parallel to said M-ESP of said LMC layer, to be injected via said energy-gap, to change said M-ESP of said LMC layer; and

a non-magnetic material in electrical communication with said LMC layer, said non-magnetic material to provide a spin-balanced source of electrons to said LMC layer, responsive to injection of spin-polarized electrons into said LMC layer.

2. Said apparatus of claim 1, wherein said energy-gap is a tunnel junction layer of material.

3. Said apparatus of claim 2, wherein said tunnel junction layer of material is aluminum oxide.

4. Said apparatus of claim 1, wherein said energy-gap is a normal conductor disposed between a first magnetic mirror and a second magnetic mirror.

5. Said apparatus of claim 1, further comprising a first magnetic-mirror layer of material (MM) having an ESP, wherein said first MM to substantially allow electrons having an ESP parallel to said ESP of said first MM to pass through said first MM and to substantially prevent electrons having an ESP anti-parallel to said ESP of said first MM (anti-parallel electrons) from passing through said first MM.

6. Said apparatus of claim 5, wherein said first MM to cause an accumulation of the anti-parallel electrons to interact with and change said M-ESP of said LMC layer.

7. Said apparatus of claim 6, wherein said ESP of said first MM to change with said M-ESP of said LMC layer.

8. Said apparatus of claim 5, wherein said first MM is a half-metallic.

9. Said apparatus of claim 1, further comprising a second magnetic-mirror layer of material (MM) having an ESP, wherein said second MM to substantially allow electrons having an ESP parallel to said ESP of said second MM to pass through said second MM and to substantially prevent electrons having an ESP anti-parallel to said ESP of said second MM from passing through said second MM, said ESP of said second MM to remain parallel with a M-ESP of a dominant magnetic layer of material.

10. Said apparatus of claim 9, wherein said second MM is a half-metallic.

11. Said apparatus of claim 1, further comprising:

an isolation barrier layer of material (IB layer); and

a highly polarized low magnetic-coercivity layer of material (HP-LMC layer) in contact with said IB layer, wherein said HP-LMC layer has a M-ESP which changes with said M-ESP of said LMC layer.

12. Said apparatus of claim 1, further comprising a high magnetic-coercivity (HMC) layer of material, having a fixed M-ESP.

13. Said apparatus of claim 12, further comprising a third magnetic-mirror layer of material (MM) having an ESP, wherein said third MM to substantially allow electrons having an ESP parallel to said ESP of said third MM to pass through said third MM and to substantially prevent electrons having an ESP anti-parallel to said ESP of said third MM from passing through said third MM, said ESP of said third MM remaining parallel with said fixed M-ESP of said HMC layer.

14. Said apparatus of claim 13, wherein said third MM is a half-metallic.

15. Said apparatus of claim 12, further comprising:

an isolation barrier layer of material (IB layer) ; and

a highly polarized low magnetic-coercivity layer of material (HP-LMC layer) in contact with said IB layer, wherein said HP-LMC layer has a M-ESP remaining parallel with said fixed M-ESP of said HMC layer.

16. Said apparatus of claim 12, further comprising:

a first conductor; and

a second conductor, wherein said LMC layer, said energy-gap, and said HMC layer being disposed between said first conductor and said second conductor.

17. Said apparatus of claim 16, wherein a first impedance to be measured between said first conductor and said second conductor when said M-ESP of said LMC layer and said M-ESP of said HMC layer are similar.

18. Said apparatus of claim 16, wherein a second impedance to be measured between said first conductor and said second conductor when said M-ESP of said LMC layer and said M-ESP of said HMC layer are different.

19. Said apparatus of claim 12, wherein a magnetic flux of said HMC layer rotates within a plane of said HMC layer.

20. Said apparatus of claim 12, further comprising an anti-ferromagnetic layer of material, having an ESP being dominated by said fixed M-ESP of said HMC layer.

21. Said apparatus of claim 12, wherein said HMC layer is alnico.

22. Said apparatus of claim 1, further comprising:

an isolation barrier layer of material (IB layer); and

a highly polarized low magnetic-coercivity layer of material (HP-LMC layer) in contact with said IB layer, wherein said HP-LMC layer has a M-ESP which changes with a M-ESP of a dominant magnetic layer of material.

23. Said apparatus of claim 1, wherein a magnetic flux of said LMC layer rotates within a plane of said LMC layer.

24. Said apparatus of claim 1, further comprising an anti-ferromagnetic layer of material, having an ESP which changes with said M-ESP of said LMC layer.

25. Said apparatus of claim 1, further comprising an anti-ferromagnetic layer of material, having an ESP which changes with an M-ESP of a dominant magnetic material.

26. Said apparatus of claim 1, wherein said LMC layer is permaloy.

27. Said apparatus of claim 1, wherein said non-magnetic material is a normal conductor such as copper.

28. A magnetic random access memory (MRAM) apparatus, comprising:

a low magnetic-coercivity layer of material (LMC layer) having a majority electron-spin polarization (M-ESP);

an energy-gap coupled with said LMC layer, wherein a flow of spin-polarized electrons anti-parallel to said M-ESP of said LMC layer, to be injected via said energy-gap, to change said M-ESP of said LMC layer;

a non-magnetic material in electrical communication with said LMC layer, said non-magnetic material to provide a spin-balanced source of electrons to said LMC layer, responsive to injection of spin-polarized electrons into said LMC layer;

a high magnetic-coercivity layer of material (HMC layer) , having a fixed M-ESP;

a first conductor; and

a second conductor, said LMC layer, said energy-gap, and said HMC layer being disposed between said first conductor and said second conductor, wherein a first impedance to be measured between said first conductor and said second conductor when said M-ESP of said

LMC layer and said M-ESP of said HMC layer are similar and a second impedance to be measured between said first conductor and said second conductor when said M-ESP of said LMC layer and said M-ESP of said HMC layer are different to create two logic states.

29. Said apparatus of claim 28, wherein said energy-gap is a tunnel junction layer of material.

30. Said apparatus of claim 28, wherein said energy-gap is a normal conductor disposed between a first magnetic mirror and a second magnetic mirror.

31. Said apparatus of claim 28, further comprising:

a processor coupled with said MRAM;

a system bus coupled with said processor; and

a MRAM controller, wherein said MRAM to store or read data from said MRAM.

32. Said apparatus of claim 31, further comprising a display coupled with said system bus.

33. Said apparatus of claim 28, further comprising a first magnetic-mirror layer of material (MM) having an ESP, wherein said first MM to substantially allow electrons having an ESP parallel to said ESP of said first MM to pass through said first MM and to substantially prevent electrons having an ESP anti-parallel to said ESP of said first MM (anti-parallel electrons) from passing through said first MM.

34. Said apparatus of claim 33, wherein said first MM to cause an accumulation of the anti-parallel electrons to interact with and change said M-ESP of said LMC layer.

35. Said apparatus of claim 34, wherein said ESP of said first MM to change with said M-ESP of said LMC layer.

36. Said apparatus of claim 33, wherein said first MM is a half-metallic.

37. Said apparatus of claim 28, further comprising a second magnetic-mirror layer of material (MM) having an ESP, wherein said second MM to substantially allow electrons having an ESP parallel to said ESP of said second MM to pass through said second MM and to substantially prevent electrons having an ESP anti-parallel to said ESP of said second MM from passing through said second MM, said ESP of said second MM remaining parallel with said fixed M-ESP of said HMC layer.

38. Said apparatus of claim 37, wherein said second MM is a half-metallic.

39. Said apparatus of claim 28, further comprising a third magnetic-mirror layer of material (MM) having an ESP, wherein said third MM to substantially allow electrons having an ESP parallel to said ESP of said third MM to pass through said third MM and to substantially prevent electrons having an ESP anti-parallel to said ESP of said third MM from passing through said third MM, said ESP of said third MM changing with a M-ESP of a dominant magnetic layer of material.

40. Said apparatus of claim 39, wherein said third MM is a half-metallic.

41. Said apparatus of claim 28, further comprising an anti-ferromagnetic layer of material having an ESP, which changes with said M-ESP of said LMC layer.

42. Said apparatus of claim 28, further comprising an anti-ferromagnetic layer of material having an ESP being dominated by said fixed M-ESP of said HMC layer.

43. Said apparatus of claim 28, further comprising an anti-ferromagnetic layer of material having an ESP, which changes with an M-ESP of a dominant magnetic material.

44. Said apparatus of claim 28, further comprising:

an isolation barrier layer of material (IB layer) ; and

a highly polarized low magnetic-coercivity layer of material (HP-LMC layer) in contact with said IB layer, wherein said HP-LMC layer has a M-ESP which changes with said M-ESP of said LMC layer.

45. Said apparatus of claim 28, further comprising:

an isolation barrier layer of material (IB layer); and

a highly polarized low magnetic-coercivity layer of material (HP-LMC layer) in contact with said IB layer, wherein said HP-LMC layer has a M-ESP remaining parallel with said fixed M-ESP of said HMC layer.

46. Said apparatus of claim 28, further comprising:

an isolation barrier layer of material (IB layer); and

a highly polarized low magnetic-coercivity layer of material (HP-LMC layer) in contact with said IB layer, wherein said HP-LMC layer has a M-ESP which changes with a M-ESP of a dominant magnetic layer of material.

47. A method comprising:

polarizing a high magnetic-coercivity layer of material (HMC layer) with a first majority electron-spin-polarization (M-ESP);

depositing an energy-gap; and

depositing a low magnetic-coercivity layer of material (LMC layer).

48. Said method of claim 47, wherein said energy-gap is a tunnel junction layer of material (TJ layer).

49. Said method of claim 48, wherein said TJ layer is aluminum oxide.

50. Said method of claim 47, wherein said energy-gap is a normal conductor disposed between a first magnetic mirror and a second magnetic mirror.

51. Said method of claim 47, further comprising depositing a non-magnetic material in electrical communication with said LMC layer.

52. Said method of claim 47, wherein said HMC layer is alnico.

53. Said method of claim 47, wherein said LMC layer is permaloy.

54. Said method of claim 47, further comprising depositing a magnetic-mirror layer of material (MM).

55. Said method of claim 54, wherein said MM is a half-metallic.

56. Said method of claim 55, wherein said half-metallic is aluminum oxide.

57. Said method of claim 54, further comprising:

depositing an isolation barrier layer of material (IB layer); and

depositing a highly polarized magnetic layer of material coupled with said IB layer.

58. Said method of claim 54, wherein said HMC layer is alnico.

59. Said method of claim 54, further comprising depositing an anti-ferromagnetic layer of material.

60. A method comprising:

injecting a flow of spin-polarized electrons via an energy-gap;

accumulating said spin-polarized electrons, from said injecting, in a low magnetic-coercivity layer of material (LMC layer) having a majority electron-spin-polarization (M-ESP) anti-parallel to said spin-polarized electrons; and

flipping said M-ESP of said LMC layer to be parallel with said spin-polarized electrons due to said accumulating.

61. Said method of claim 60, further comprising providing a spin-balanced source of current to said LMC layer, responsive to injection of said spin-polarized electrons into said LMC layer.

62. Said method of claim 61, further comprising providing a spin-balanced source of current to said LMC layer, responsive to injection of said spin-polarized electrons into said LMC layer and subsequent scattering of electrons, having an ESP parallel to said M-ESP of said LMC layer, from said LMC layer.

63. Said method of claim 60, wherein said energy-gap is a tunnel junction layer of material.

64. Said method of claim 60, wherein said energy-gap is a normal conductor disposed between a first magnetic mirror and a second magnetic mirror.

65. Said method of claim 64, wherein said first magnetic mirror is a half-metallic.

66. Said method of claim 64, wherein said second magnetic mirror is a half-metallic.

67. Said method of claim 60, further comprising:

measuring a first impedance across a combination of said energy-gap, said LMC layer, and a high magnetic-coercivity layer of material (HMC layer), when a M-ESP of said LMC layer and a M-ESP of said HMC layer are parallel; and

measuring a second impedance across a combination of said energy-gap, said LMC layer, and a high magnetic-coercivity layer of material (HMC layer), when said M-ESP of said LMC layer and said M-ESP of said HMC layer are anti-parallel.

68. An apparatus, comprising

a magnetic layer of material having a majority electron-spin-polarization (M-ESP); and

a magnetic-mirror layer of material (MM) having an ESP, wherein said MM to substantially allow electrons having an ESP parallel to said ESP of said MM to pass through said MM and to substantially prevent electrons having an ESP anti-parallel to said ESP of said MM (anti-parallel electrons) from passing through said MM and said MM to cause an accumulation of the anti-parallel electrons to effect said M-ESP of said magnetic layer of material.

69. Said apparatus of claim 68, wherein, said ESP of said MM to change with said M-ESP of said magnetic layer of material.

70. Said apparatus of claim 69, wherein, said M-ESP of said magnetic layer of material to be reversed.

71. Said apparatus of claim 68, wherein said MM is a half-metallic.

72. An energy-gap apparatus comprising:

a first magnetic mirror (MM);

a second magnetic mirror (MM); and

a conductive layer of material disposed between said first MM and said second MM to magnetically decouple said first MM from said second MM.

73. Said apparatus of claim 72, wherein said first MM is a half-metallic.

74. Said apparatus of claim 72, wherein said second MM is a half-metallic.

75. Said apparatus of claim 72, further comprising:

a low magnetic-coercivity layer of material (LMC layer), having a majority electron-spin-polarization (M-ESP), wherein said first MM having an ESP parallel to said M-ESP of said LMC layer, wherein said first MM to substantially allow electrons having an ESP parallel to said ESP of said first MM to pass through said first MM and to substantially prevent electrons having an ESP anti-parallel to said

ESP of said first MM (anti-parallel electrons) from passing through said first MM, said first MM coupled with said LMC layer; and

a high magnetic-coercivity layer of material (HMC layer), having a M-ESP, wherein said second MM having an ESP parallel to said M-ESP of said HMC layer, wherein said second MM to substantially allow electrons having an ESP parallel to said ESP of said second MM to pass through said second MM and to substantially prevent electrons having an ESP anti-parallel to said ESP of said second MM from passing through said second MM, said second MM coupled with said HMC layer.

76. Said apparatus of claim 75, wherein said first MM to cause an accumulation of the anti-parallel electrons to interact with and change said M-ESP of said LMC layer.

77. Said apparatus of claim 76, wherein said ESP of said first MM to change with said M-ESP of said LMC layer.

78. Said apparatus of claim 75, wherein a first impedance to be measured between said LMC layer and said HMC layer when said M-ESP of said LMC layer and said M-ESP of said HMC layer are parallel.

79. Said apparatus of claim 75, wherein a second impedance to be measured between said LMC layer and said HMC layer when said M-ESP of said LMC layer and said M-ESP of said HMC layer are anti-parallel.

80. Said apparatus of claim 75, wherein said second impedance is larger than said first impedance.

81. Said apparatus of claim 78, wherein said first impedance corresponds with a first memory state of a memory cell and said second impedance corresponds with a second memory state of said memory cell.

82. Said apparatus of claim 72, further comprising:

a low magnetic-coercivity layer of material (LMC layer ), having a majority electron-spin-polarization (M-ESP) parallel with an electron-spin-polarization (ESP) of said first MM;

a high magnetic coercivity layer of material (HMC layer), having a fixed M-ESP, said second MM having an ESP parallel with said fixed M-ESP of said HMC layer.

83. Said apparatus of claim 82, wherein a flow of spin-polarized electrons having an ESP anti-parallel to said M-ESP of said LMC layer to be injected from said HMC layer to said LMC layer to cause an accumulation of the spin-polarized electrons to interact with and change said M-ESP of said LMC layer.

84. Said apparatus of claim 83, wherein said ESP of said first MM to change with said M-ESP of said LMC layer.

85. A apparatus comprising:

means for injecting a flow of spin-polarized electrons;

means for accumulating said spin-polarized electrons in a low magnetic-coercivity layer of material (LMC layer) having a majority electron-spin-polarization (M-ESP) anti-parallel to said spin-polarized electrons, wherein said M-ESP of said LMC layer is reversed due to said means for accumulating.

86. Said apparatus of claim 85, further comprising means for providing a spin-balanced source of current to said LMC layer of material, responsive to injection of said spin-polarized electrons into said LMC layer.

87. Said apparatus of claim 86, further comprising means for providing a spin-balanced source of current to said LMC layer of material, responsive to injection of said spin-polarized electrons into said LMC layer and subsequent scattering of electrons, having an ESP parallel to said M-ESP of said LMC layer, from said LMC layer.

88. Said apparatus of claim 85, wherein said energy-gap is a tunnel junction layer of material.

89. Said apparatus of claim 85, wherein said energy-gap is a normal conductor disposed between a first magnetic mirror and a second magnetic mirror.

90. Said apparatus of claim 89, wherein said first magnetic mirror is a half-metallic.

91. Said apparatus of claim 89, wherein said second magnetic mirror is a half-metallic.